Determination of Daily Sediment, Nutrient, and Sediment-Associated Chemical Concentrations and Loads for the Conterminous U.S. Piloted in the Mississippi River Basin

John R. Gray (USGS), Chuck E. Shadie (COE), Jim Stefanov (USGS) and Charlie Crawford (USGS)

with considerable heavy lifting by our USGS and COE colleagues

Follow-up to the July 27 and Oct. 6, 2009, USGS-COE Quarterly Meetings

USGS National Center, Reston, VA

US Army Corps of Engineers.

February 2, 2010

National Sediment & QW Monitoring Program

- Per Oct. 6, 2009, USGS-COE meeting directives

"Provide a proposal for National Sediment and QW monitoring, piloted in the Mississippi River Basin, at next Quarterly Mtg."

- Sept. 27 USGS-COE meeting
- Nov. 3 EPA/NOAA/USDA meeting
- And here we are…

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National Sediment & QW Monitoring Program, Piloted in MRB

- Formal submission of Proposal to COE and USGS
- Brief background
- Need for Monitoring Program
- Description of Key Program components
- Potential Partners

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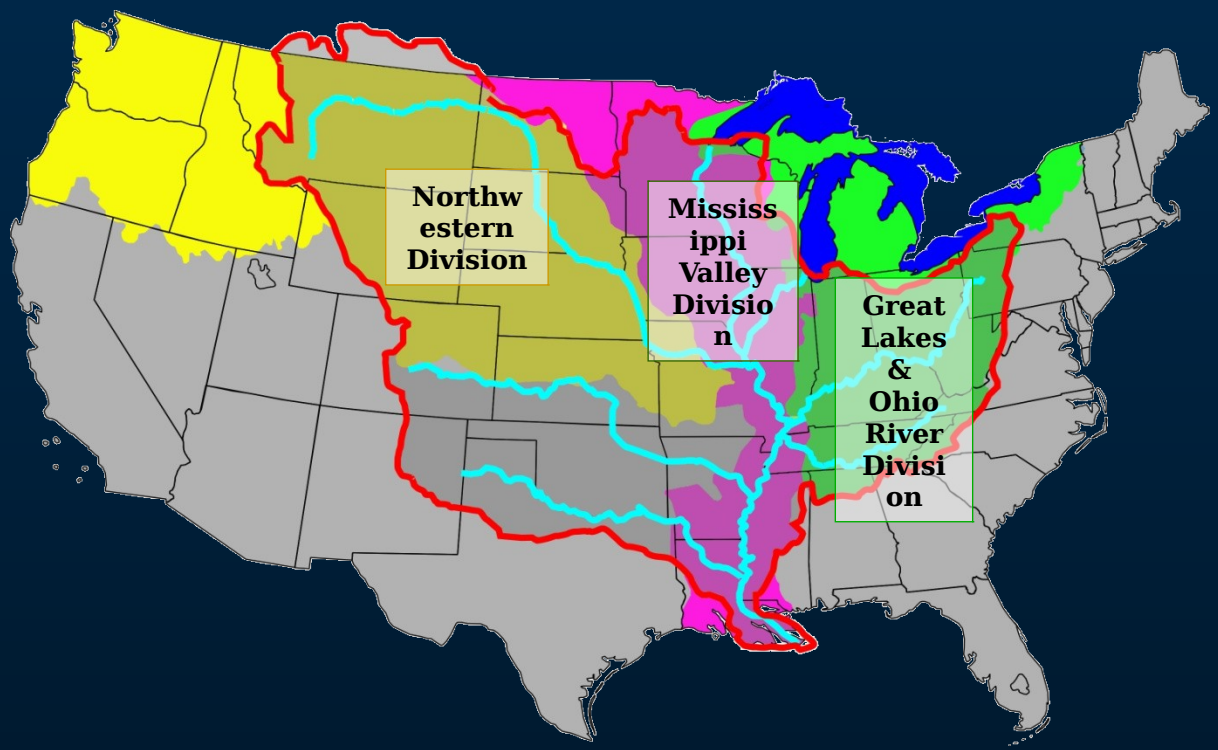
USGS/COE Proposal for a Long-Term National Monitoring Program initiated as a Mississippi River Basin Pilot Program



A Proposal to Establish a Long-Term, Base-Funded, Network-Design National Monitoring Network to Generate Sediment, Nutrient, and Sediment-Associated Chemical Concentrations, Loads, Budgets and Tempor Trends

Integrated

U.S. Department of the Interior
U.S. Geological Survey
USGS

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VISION: A NATIONAL Sediment & QW Monitoring Program Cost/Benefits

- $75-$90M annually, 400-450 stations
- Based on National Monitoring Network Design (ACWI)
- National Program cost <1% of estimated costs/sediment damages annually
- Ergo, 1% reduction in damages/costs will pay for the National Program

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NOW: Mississippi River Basin Pilot Program

- $17.6M in FY2012; ~$14M annually thereafter
- Based in part on National Monitoring Network Design (~50% of available NMN sites)
- The means for quantifying sediment and QW fluxes to address large-scale problems
- A framework for supporting “nested” sediment- & QW-flux research on smaller scales

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Who Cares?

- **Sediment Damages in North America (mostly in US) total $20-$50 BILLION annually (ARS-USGS)**
- **As much as 25 mi^2 Louisiana Coast lost annually**
- **Northern Gulf of Mexico Hypoxia**
- **COE dredging programs in MRB alone total ~$1Billion annually**
- **EPA, NOAA, USDA, others have major investments in MRB**

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Why Now?

- **Because it wasn't done before…!**
- **Because it is necessary for making informed decisions on resources management.**
- **Because even modest returns on investment will pay for the program – likely many times over.**
- **Because reliable, network-design-based information will greatly increase the accuracy of our models.**

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MRB Pilot Program -- OBJECTIVES

1. Establish a sediment, nutrient, and solid-phase QW monitoring program on the Mississippi, Missouri, and Ohio Rivers, and selected tributaries to compute fluxes at key spatial and time scales.

2. Ascertain trends in sediment and constituent transport on selected economic, ecologic, and restoration activities in the MRB.

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MRB Pilot Program -- Scope

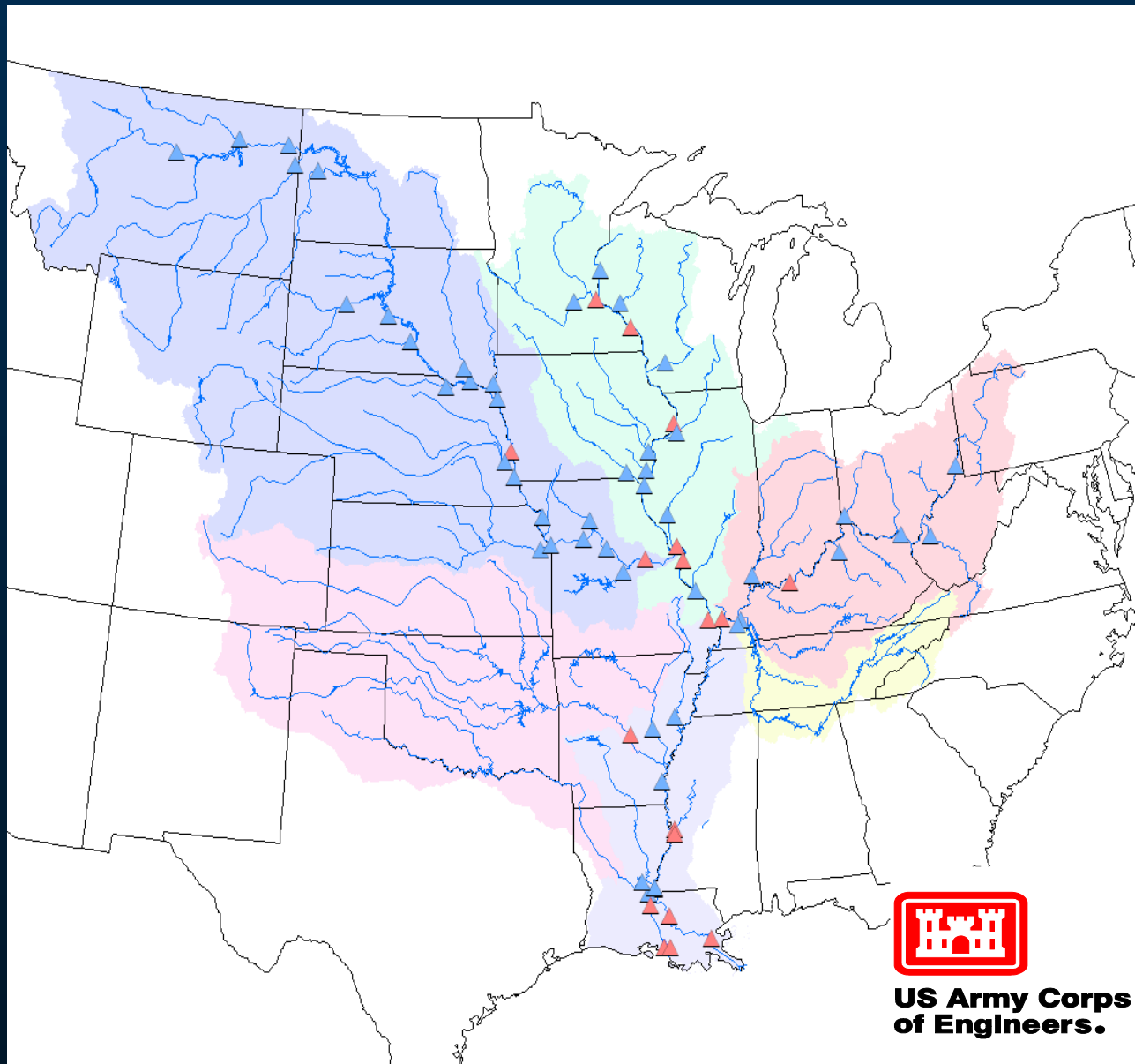
- **68 stations**
  - 20 priority 1
  - 48 priority 2
  - Max use of USGS gages & programs

Priority 1:

Large-scale processes

Priority 2:

Watershed proc./issues



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MRB Pilot Program -- Constituents

- **Suspended Sediment (routine)**
  - Fluxes by size category (silt/clay vs sand)
  - Full gradation from samples
  - Nutrients, other QW
- **Filtered Water (routine)**
  - Nutrients, common ions, trace elem., pesticides, other
- **Bed Material (2/year)**
  - Gradation
  - Selected QW
- **Bedload (non-routine)**

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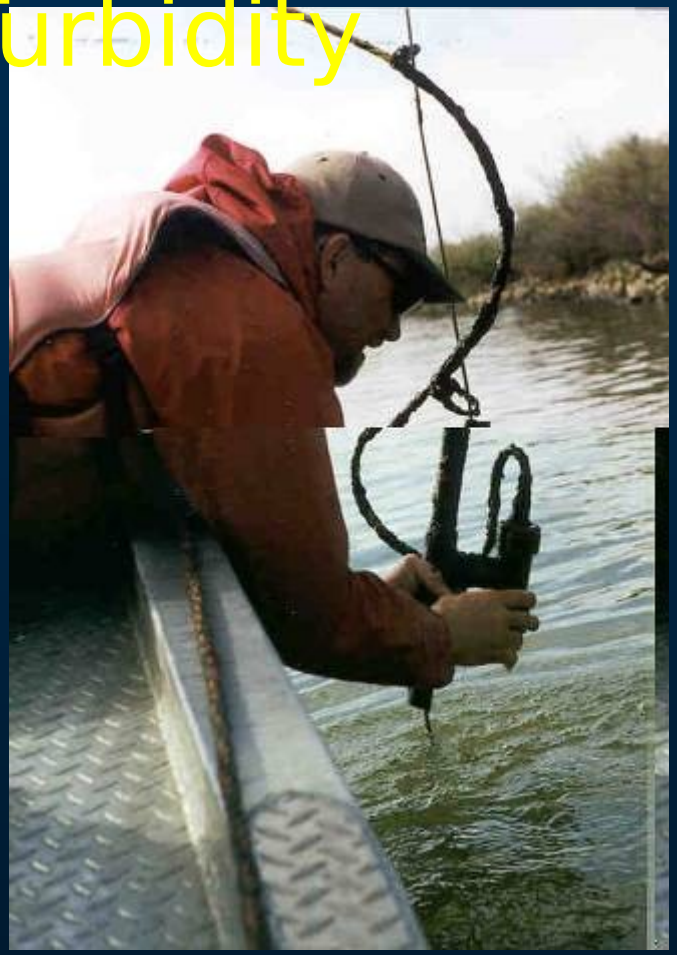
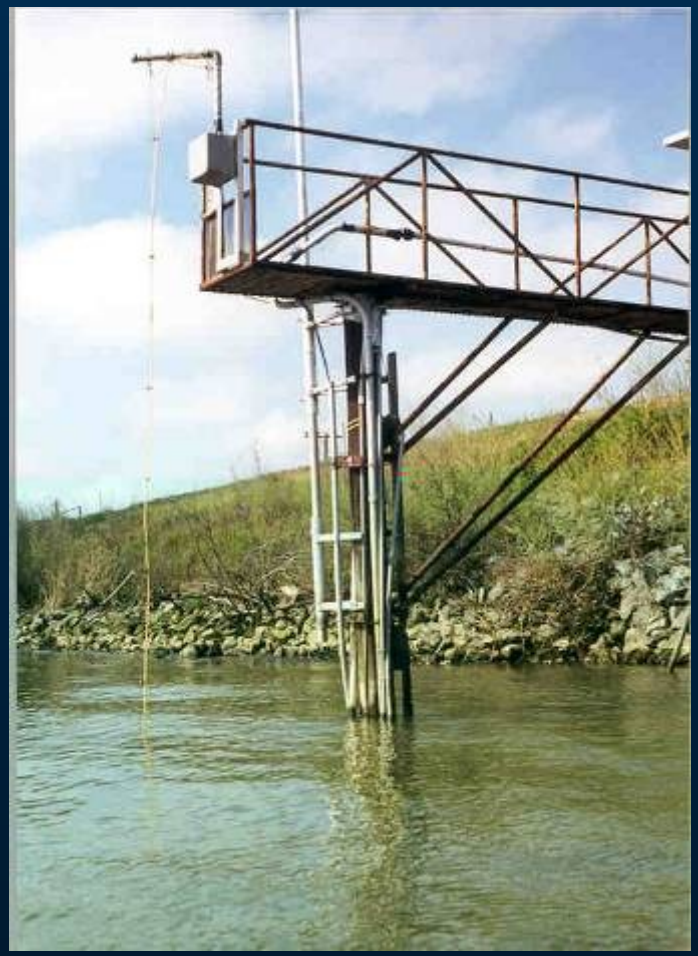
Traditional Equipment and Methods

Federal Interagency Sedimentation Project Samplers and Sampling Techniques Are the Standards for quality-assured data

USA, and International Standards Organization

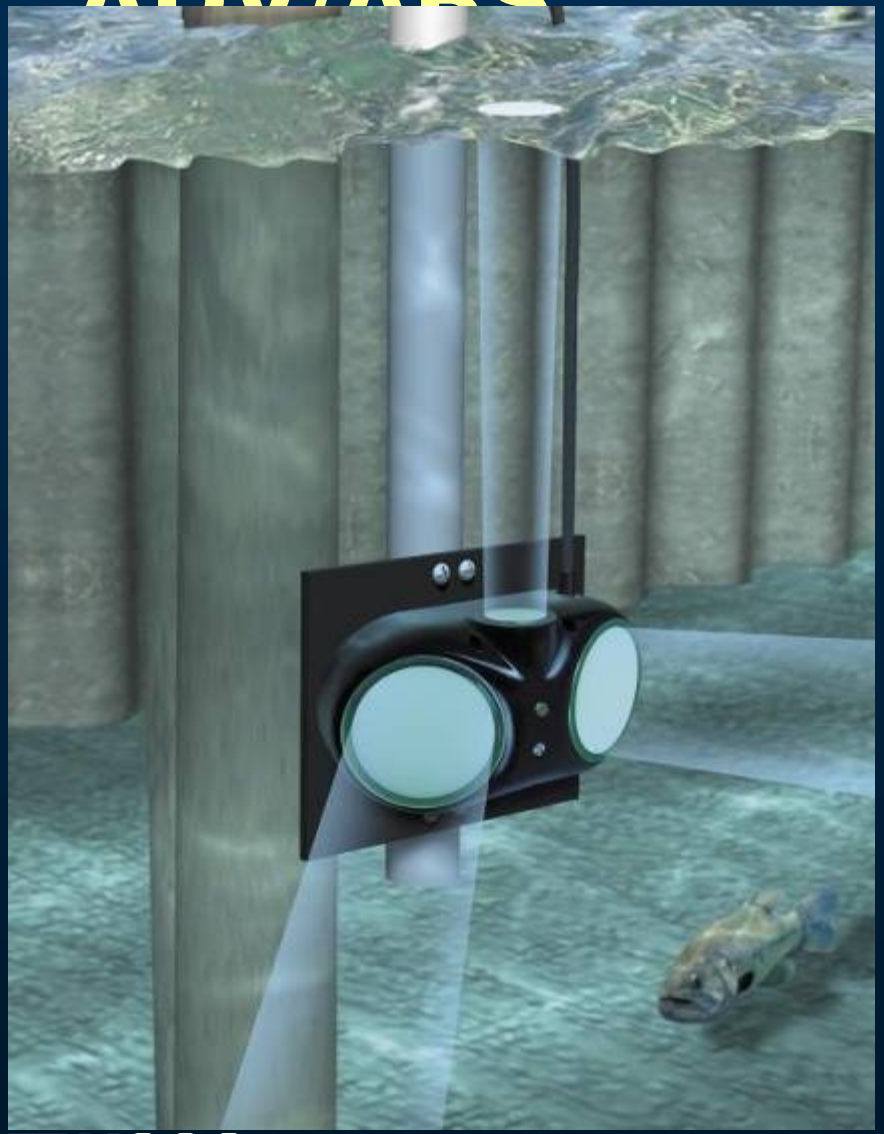
Optical Backscatterance & Turbidity





Paul Buchanan (USGS), San Francisco/Delta Bay, April 1999

Example: Side-Looking ADV/ABS



Courtesy of Sontek/YSI, Inc.

Sontek Long-Range
Argonaut-SL Systems
Single Frequency

1.5 – 120 meter penetration

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Isokinetic withdrawal LISST-SL

- Active control, pump-assisted isokinetic withdrawal
- Pitot tube velocity sensor
- 2-Wire communication
- Optional internal battery
- Low drag permits low weight.

Cooperative Research and Development Project
Between Sequoia, Sci., Inc.,USGS, FISP

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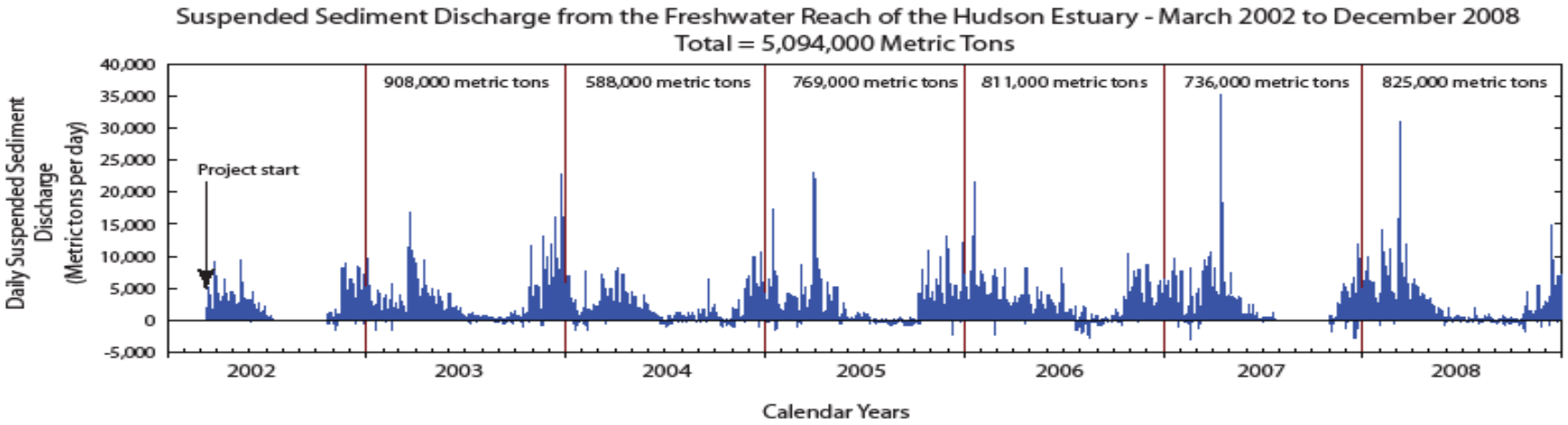
Hudson River – Daily/Annual Loads



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MRB Pilot Program – Synthesis

- ID Principal Sources/Sinks of sediment, nutrients, other QW constituents.
- Identify phase of transport of sediments as a function of location, flow, other variables.
- Calibrate model(s) to “allocate” sediment to source types based on digital coverages, thus enabling simulation of sediment transport by real or simulated land use.
- All data on-line/publically available.

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MRB Pilot Program – MRB Pilot Prelude?

- **Interest in initiating Louisiana MRB monitoring in 2010 (Science and Technology Program – COE and Louisiana).**

- **Proof-of-concept / demonstration for surrogate monitoring, and shake-out for methodologies/protocols.**

- **Represents a phased approach.**

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MRB Pilot Program – Potential Partners

- **EPA and NOAA have considerable interest in sources and transport mechanisms for nutrients.**
- **USDA likewise has interest in sediment and nutrient transport from farmlands to receiving waters.**
- **31 MRB States have vested interests.**

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Summary

- MRB Pilot Program, 2012++, $17.6M yr 1, ~$14M thereafter until subsumed by ~$75-$90M/yr National Program.
- Based in part on National Monitoring Network Design – no substitute for some level o baseline monitoring.
- Provide technically supportab basis for modeling and management.
- Provide improved information for decision-makers on various projects in the MRB.

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Next Step?

- Full proposal and synopsis respectfully submitted by the COE and USGS development team.
- Both publically available.
- Intend to share with EPA, NOAA, USDA, and other potential partners.
- Guidance on how to proceed.
- Thanks for the opportunity to share our half-year-long efforts.

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